



Dalian Good Display Co., Ltd

LCD Module User Manual
YM 128128-07

Tel.: 86-411-84619565

Fax: 86-411-84619585

E-mail: sales @ good-lcd .com

Website: <http://www.good-lcd.com>



REVISION RECORD		
REV. NO.	DATA	REVISION ITEMS
1.0	Decmber 20, 2007	First Release Version



Contents

1.Scope-----	4
2.Warranty-----	4
3.Features-----	4
4.Mechanical Diagram-----	6
5.I/O Terminal-----	7
6. Quality Level-----	13
7.Reliability-----	17
8.Handling Precautions-----	17
9.Precautions for Use-----	18



1.Scope

This manual defines general provisions as well as inspection standards for standard LCD module. If the event of unforeseen problem or unspecified items may occur, please contact the nearest supplier or our company.

2.Warranty

If module is not stored or used as specified in this manual, it will be void the 12- month warranty.

3.Features

3-1. Features

- (1) Display mode:
 - Transflective type
 - FSTN LCD
- (2) Display color:
 - Display dots: Black
 - Background: Grey
- (3) Display Fonts: Graphics Matrix
- (4) Input data: 3 SPI interfaced from a MPU
- (5) Multiplex ratio: 1/128 Duty, 1/12 Bias
- (6) Viewing direction: 6 O'clock
- (8) Controller: ST7541

3-2. Mechanical features

Item	Specifications	Unit
Outline dimensions	44.0(W)×51.0(H) ×2.0Max.(T)	mm
Viewing Area	41.0(W)×41.0(H)	mm
Image Area	35.82(W)×35.82(H)	mm
Number of Dots	128(W) ×128(H)	mm
Dot Size	0.26(W)×0.26(H)	mm
Dot Pitch	0.28(W)×0.28(H)	mm
Weight	---	g

3-4.Absolute maximum ratings

Item	Symbol	Condition	Min	Max	Units
Power supply for logic	Vdd	25℃	1.8	3.3	V
Operating voltage for LCD	V0	25℃	--	15.0	V
Operating temperature	Top	---	- 20	70	℃
Storage temperature	Tstg	---	- 30	80	℃



Note:

- 1) The modules may be destroyed if they are used beyond absolute maximum ratings. In ordinary operation, it is desirable to use them within recommended operation conditions. Using the modules beyond these conditions may cause malfunction and poor reliability.
- 2) All voltage values are referenced to GND=0V.

3-4 Electrical characteristics (VDD=3.0V, Vss=0V, Ta = 25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage for logic and for converter voltage	Vdd	25°C	-	3.0	3.3	V
Current consumption	Idd	25°C	-	2.0	-	mA
Input High Voltage	Vih	Vdd=3.0V	0.8Vdd	---	Vdd	
Input Low Voltage	Vil	Vdd=3.0V	Vss	---	0.2Vdd	

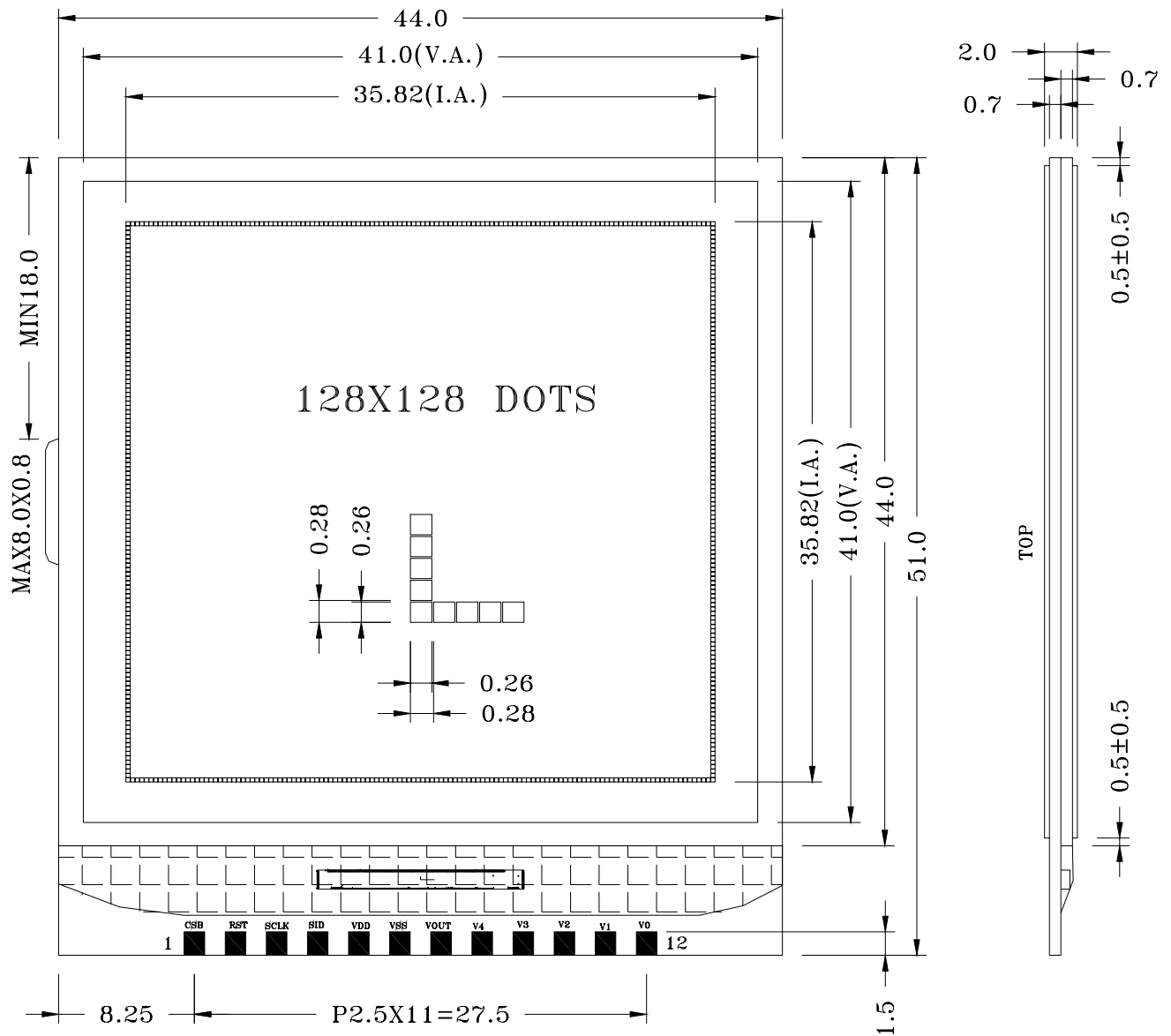
Note: All the dots are in the static state.

3-5.Electro-Optic Characteristics

NO	Item	Symbol	Min	Typ.	Max	Unit	Condition
1	Supply Voltage(Logic)	Vdd-Vss	--	3.0	--	V	
2	Supply Current (Logic)	Idd	--	16.4	--	mA	Vdd=3V
3	LCD Driving Voltage	Vout	--	13.0	--	V	-20°C
			--	12.6	--	V	25°C
			--	12.3	--	V	70°C
4	Response Time	Ton	--	320	--	ms	
		Toff	--	75	--	ms	
5	LCD Operation Voltage	VLCD	--	11.4	--	V	25°C



4. Mechanical Diagram





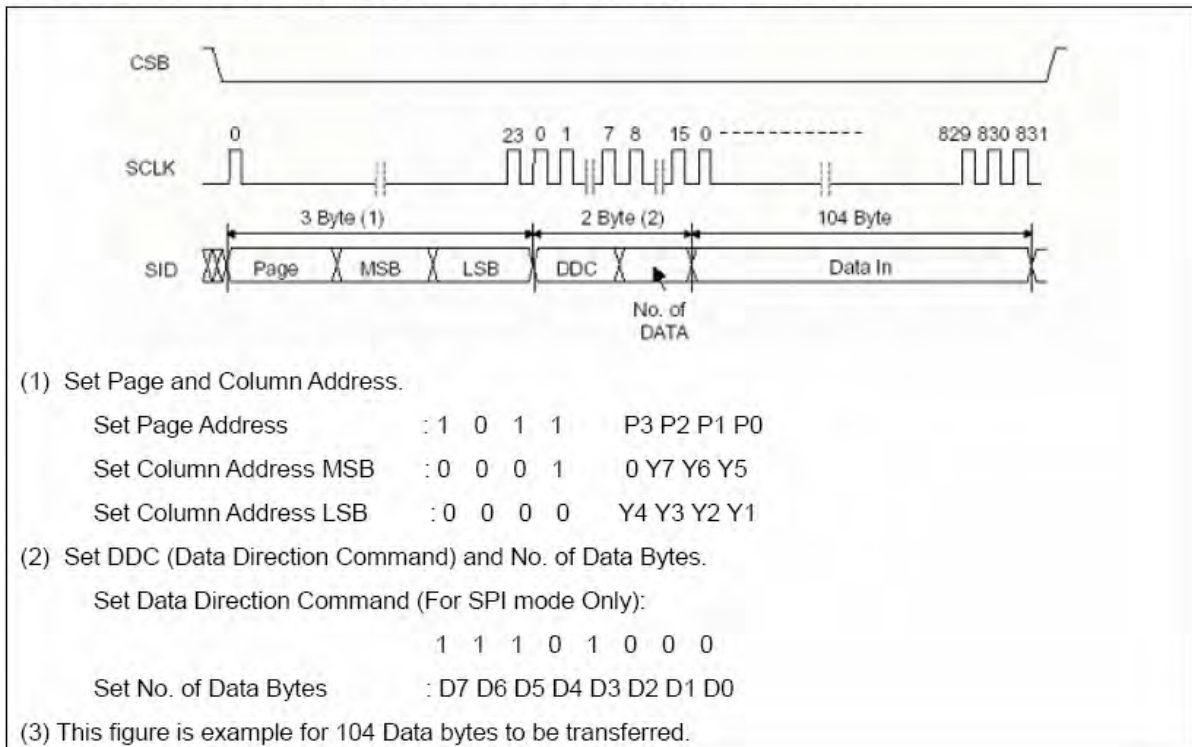
5.I/O Terminal

PIN	Symbol	I/O	Description
1	CSB	I	Chip Select (active low)
2	RST	II	Rest (active low)
3	SCLK	I	Serial input clock (DB6)
4	SID	I	Serial input data (DB7)
5	VDD	--	Power supply for logic
6	VSS	--	Ground pin
7	VOUT	--	Main LCD driving voltage input
8	V4	--	LCD driver voltage Tap4 (to 100 nF de-coupler)
9	V3	--	LCD driver voltage Tap3 (to 100 nF de-coupler)
10	V2	--	LCD driver voltage Tap2 (to 100 nF de-coupler)
11	V1	--	LCD driver voltage Tap1 (to 100 nF de-coupler)
12	V0	--	LCD driver voltage Tap0 (to 100 nF de-coupler)

5-2 Signal timing diagram

3-Line SPI Mode (PS0 = "L", PS1 = "L", PS2 = "L")

To write data to the DDRAM, send Data Direction Command in 3-Line SPI mode. Data is latched at the rising edge of SCLK. And the DDRAM column address pointer will be increased by one automatically.





SERIAL INTERFACE(3-Line Interface)

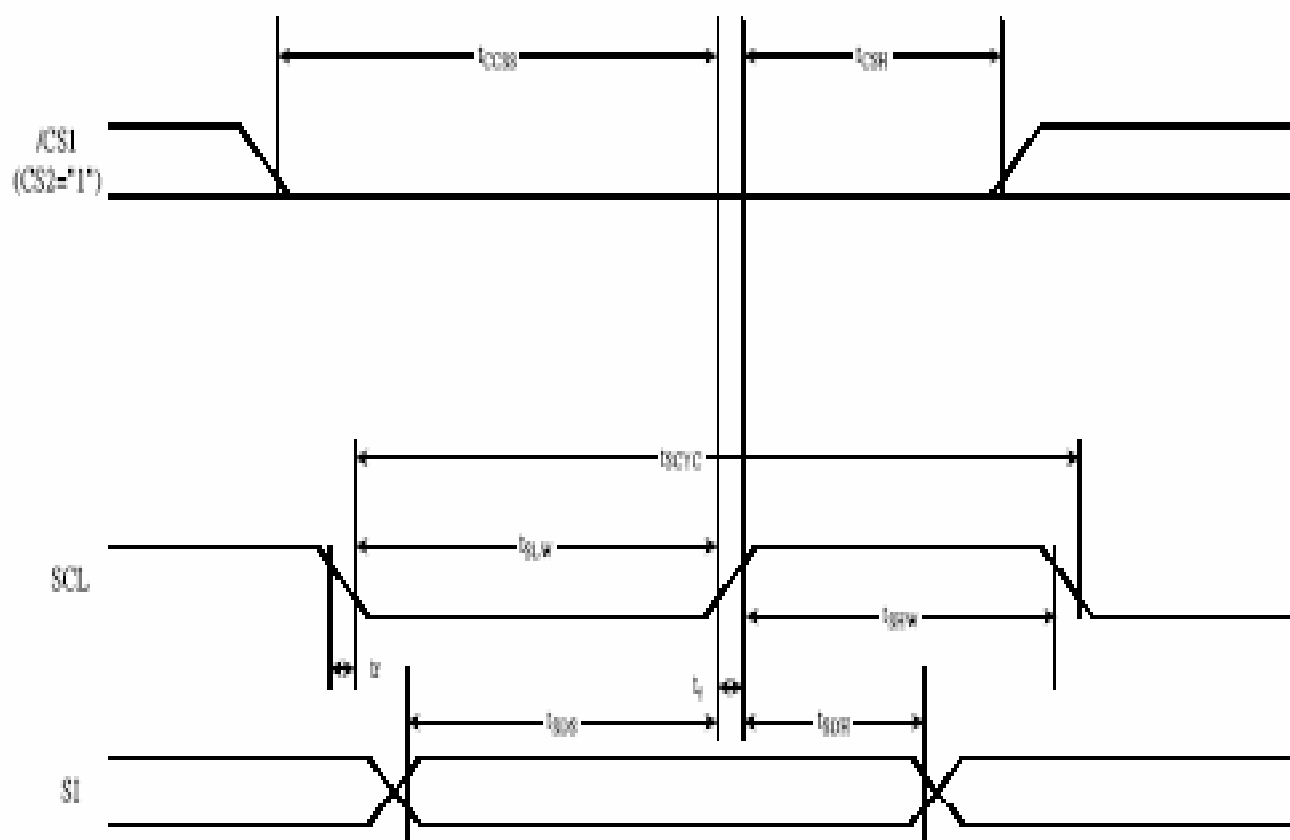


Figure 32

(V_{DD}=3.3V, T_a=-30~85°C)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	t_{SCYC}		50	—	ns
SCL "H" pulse width		t_{SHW}		25	—	
SCL "L" pulse width		t_{SLW}		25	—	
Data setup time	SI	t_{SDG}		20	—	
Data hold time		t_{SDH}		10	—	
CS-SCL time	CSB	t_{CSS}		20	—	
CS-SCL time		t_{CSH}		40	—	

(V_{DD}=2.7V, Ta=-30~85°C)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	tSCYC		100	—	ns
SCL "H" pulse width		tSHW		50	—	
SCL "L" pulse width		tSLW		50	—	
Data setup time	SI	tSDS		30	—	
Data hold time		tSDH		20	—	
CS-SCL time	CSB	tCSS		30	—	
CS-SCL time		tCSH		60	—	

(V_{DD}=1.8V, Ta=-30~85°C)

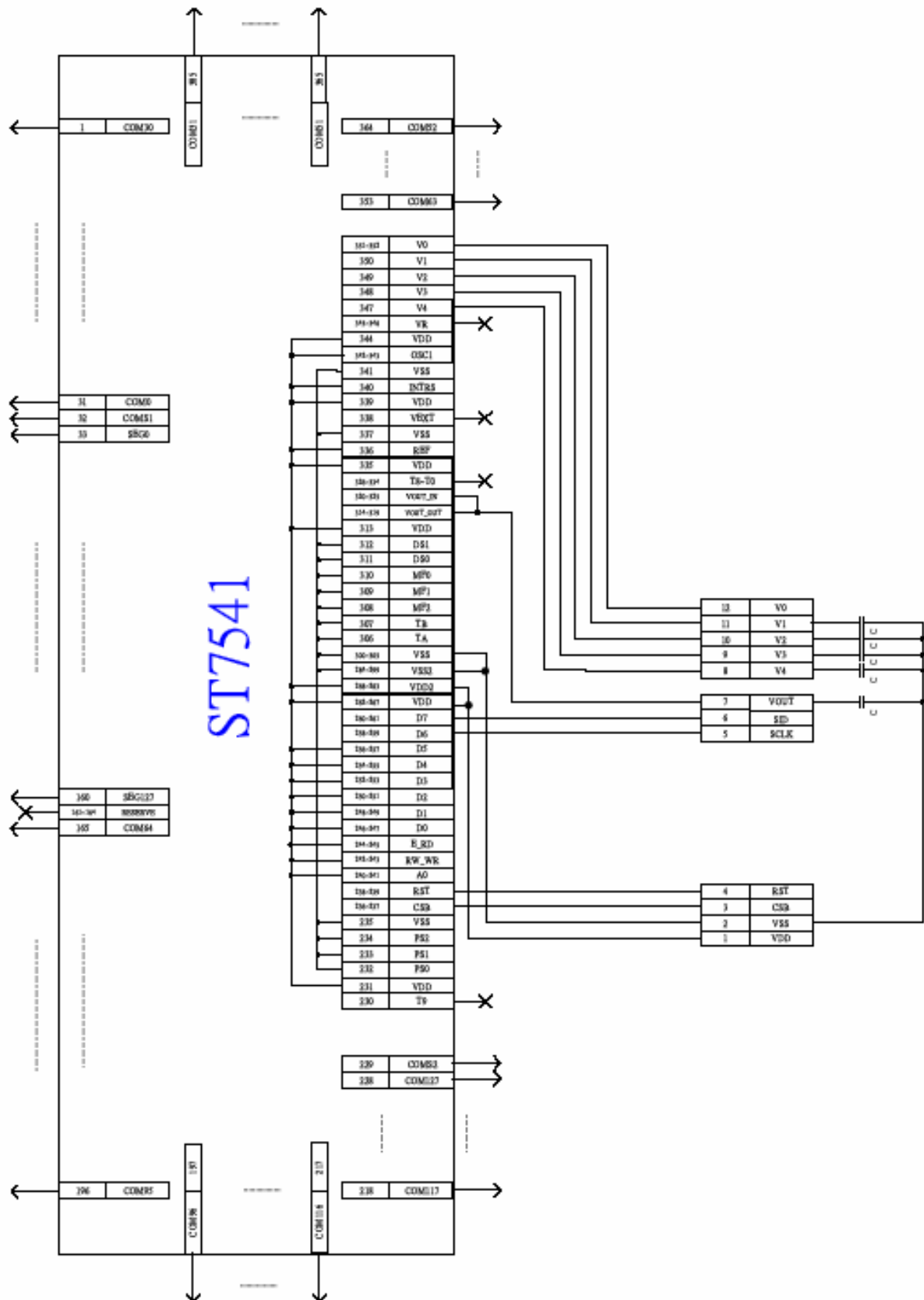
Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	tSCYC		200	—	ns
SCL "H" pulse width		tSHW		80	—	
SCL "L" pulse width		tSLW		80	—	
Data setup time	SI	tSDS		60	—	
Data hold time		tSDH		30	—	
CS-SCL time	CSB	tCSS		40	—	
CS-SCL time		tCSH		100	—	

*1 The input signal rise and fall time (tr, tf) are specified at 15 ns or less.

*2 All timing is specified using 20% and 80% of VDD as the standard.



5-3.Reference circuit examples





6. Quality Level

6-1 Inspection conditions

6-1-1 The environmental conditions for inspection shall be as follows:

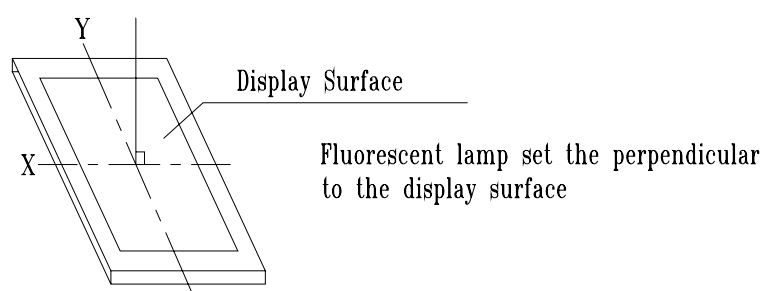
Room temperature: $20 \pm 3^{\circ}\text{C}$

Humidity: $65 \pm 20\% \text{ RH}$

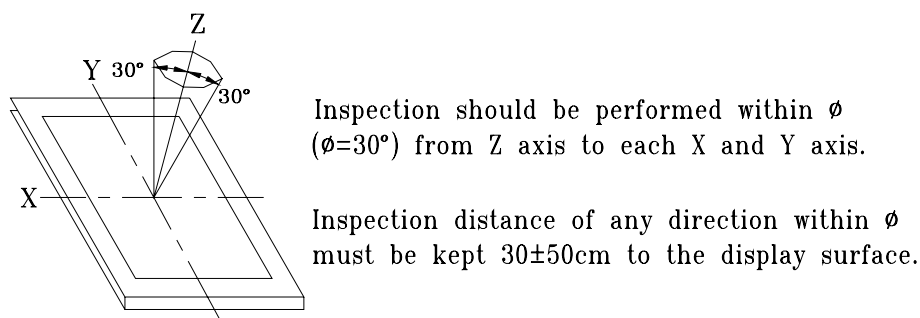
6-1-2 The external visual inspection:

The inspection shall be performed by using a 20W fluorescent lamp for illumination and the distance between LCD and the eyes of the inspector should be at least 30cm.

(1) Light method



(2) Inspection distance and angle



6-2 Sampling procedures for each item's acceptance level table

Defect type	Sampling procedure	AQL
Major defect	MIL-STD-105D Inspection Level I Normal inspection Single sample inspection	QC/07-2006(1)
Minor defect	MIL-STD-105D Inspection Level I Normal inspection Single sample inspection	QC/07-2006(1)



6-3 Classification of defects

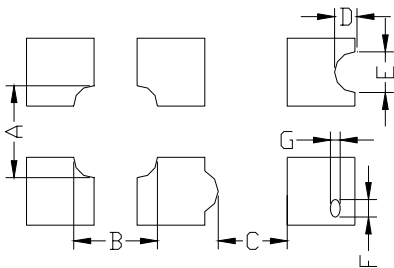
6-3-1 Major defect

A major defect refers to a defect that may substantially degrade usability for product applications.

6-3-2 Minor defect

A minor defect refers to a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation.

6-4 Inspection standard

Item	Criterion for defects	Defect type																					
1) Display on inspection	(1) Non display (2) Vertical line is deficient (3) Horizontal line is deficient (4) Cross line is deficient	Major																					
2) Black / White spot	<table><tr><th>Size Φ (mm)</th><th>Acceptable number</th></tr><tr><td>Φ ≤ 0.3</td><td>Ignore (note)</td></tr><tr><td>0.3 < Φ ≤ 0.45</td><td>3</td></tr><tr><td>0.45 < Φ ≤ 0.6</td><td>1</td></tr><tr><td>0.6 < Φ</td><td>0</td></tr></table> (Note) Not allowed if four more spots crowd together	Size Φ (mm)	Acceptable number	Φ ≤ 0.3	Ignore (note)	0.3 < Φ ≤ 0.45	3	0.45 < Φ ≤ 0.6	1	0.6 < Φ	0	Minor											
Size Φ (mm)	Acceptable number																						
Φ ≤ 0.3	Ignore (note)																						
0.3 < Φ ≤ 0.45	3																						
0.45 < Φ ≤ 0.6	1																						
0.6 < Φ	0																						
3) Black / White line	<table><tr><th>Length (mm)</th><th>Width (mm)</th><th>Acceptable number</th></tr><tr><td>L ≤ 10</td><td>W ≤ 0.03</td><td>Ignore</td></tr><tr><td>5.0 ≤ L ≤ 10</td><td>0.03 < W ≤ 0.04</td><td>3</td></tr><tr><td>5.0 ≤ L ≤ 10</td><td>0.04 < W ≤ 0.05</td><td>2</td></tr><tr><td>1.0 ≤ L ≤ 10</td><td>0.05 < W ≤ 0.06</td><td>2</td></tr><tr><td>1.0 ≤ L ≤ 10</td><td>0.06 < W ≤ 0.08</td><td>1</td></tr><tr><td>L ≤ 10</td><td>0.08 < W</td><td>follows 2) point defect</td></tr></table> Defects separate with each other at an interval of more than 20mm.	Length (mm)	Width (mm)	Acceptable number	L ≤ 10	W ≤ 0.03	Ignore	5.0 ≤ L ≤ 10	0.03 < W ≤ 0.04	3	5.0 ≤ L ≤ 10	0.04 < W ≤ 0.05	2	1.0 ≤ L ≤ 10	0.05 < W ≤ 0.06	2	1.0 ≤ L ≤ 10	0.06 < W ≤ 0.08	1	L ≤ 10	0.08 < W	follows 2) point defect	Minor
Length (mm)	Width (mm)	Acceptable number																					
L ≤ 10	W ≤ 0.03	Ignore																					
5.0 ≤ L ≤ 10	0.03 < W ≤ 0.04	3																					
5.0 ≤ L ≤ 10	0.04 < W ≤ 0.05	2																					
1.0 ≤ L ≤ 10	0.05 < W ≤ 0.06	2																					
1.0 ≤ L ≤ 10	0.06 < W ≤ 0.08	1																					
L ≤ 10	0.08 < W	follows 2) point defect																					
4) Display pattern	 [Unit: mm] <table><tr><td>A+B ≤ 0.45</td><td>0 < C</td><td>D+E ≤ 0.35</td><td>F+G ≤ 0.35</td></tr><tr><td>2</td><td></td><td>2</td><td>2</td></tr></table> Note: 1) Up to 3 damages acceptable 2) Not allowed if there are two or more pinholes every 3 of	A+B ≤ 0.45	0 < C	D+E ≤ 0.35	F+G ≤ 0.35	2		2	2	Minor													
A+B ≤ 0.45	0 < C	D+E ≤ 0.35	F+G ≤ 0.35																				
2		2	2																				



LCD Module User Manual

	fourths inch.	
5) Spot-like contrast irregularity	Size Φ (mm)	Acceptable Number
	$\Phi \leq 0.7$	Ignore (note)
	$0.7 < \Phi \leq 1.0$	3
	$1.0 < \Phi \leq 1.5$	1
	$1.5 < \Phi$	0
Note: 1) Conformed to limit samples. 2) Intervals of defects are more than 30mm.		
		Minor

Item	Criterion for defects		Defect type
6) Bubbles in polarizer	Size Φ (mm)	Acceptable Number	Minor
	$\Phi \leq 0.4$	Ignore (note)	
	$0.4 < \Phi \leq 0.65$	2	
	$0.65 < \Phi \leq 1.2$	1	
	$1.2 < \Phi$	0	
7) Scratches and dent on the polarizer	Scratches and dent on the polarizer shall be in the accordance with "2) Black/white spot", and "3) Black/White line".		Minor
8) Stains on the surface of LCD panel	Stains which cannot be removed even when wiped lightly with a soft cloth or similar cleaning.		Minor
9) Rainbow color	No rainbow color is allowed in the optimum contrast on state within the active area.		Minor
10) Viewing area encroachment	Polarizer edge or line is visible in the opening viewing area due to polarizer shortness or sealing line.		Minor
11) Bezel appearance	Rust and deep damages that are visible in the bezel are rejected.		Minor
12) Defect of land surface contact	Evident crevices that are visible are rejected.		Minor
13) Parts mounting	(1) Failure to mount parts (2) Parts not in the specifications are mounted (3) For example: Polarity is reversed, HSC or TCP falls off.		Major
14) Part alignment	(1) LSI, IC lead width is more than 50% beyond pad outline. (2) More than 50% of LSI, IC leads is off the pad outline.		Minor
15) Conductive foreign matter (solder ball, solder hips)	(1) $0.45 < \Phi$, $N \geq 1$		Major
	(2) $0.3 < \Phi \leq 0.45$, $N \geq 1$ Φ : Average diameter of solder ball (unit: mm)		Minor
	(3) $0.5 < L$, $N \geq 1$ L : Average length of solder chip (unit: mm)		Minor
16) PCB pattern damage	(1) Deep damage is found on copper foil and the pattern is nearly broken.		Major
	(2) Damage on copper foil other than 1) above		Minor
17) Faulty PCB correction	(1) Due to PCB copper foil pattern burnout, the pattern is connected, using a jumper wire for repair; 2 or more places are corrected per PCB.		Minor



LCD Module User Manual

	(2) Short-circuited part is cut, and no resist coating has been performed.	
18) Bezel flaw	Bezel claw missing or not bent	Minor
19) Indication on name plate (sampling indication label)	(1) Failure to stamp or label error, or not legible.(all acceptable if legible) (2) The separation is more than 1/3 for indication discoloration, in which the characters can be checked.	Minor

7. Reliability

7-1 Lifetime

50,000 hours (25°C in the room without ray of sun)

7-2 Items of reliability

Item	Condition	Criterion
1) High Temperature Operating	60°C 96hrs	No cosmetic failure is allowable. Contrast ratio should be between initial value $\pm 10\%$. Total current consumption should be below double of initial value.
2) Low Temperature Operation	-20°C 96hrs	
3) Humidity	40°C, 90%RH, 96hrs	No cosmetic failure is allowable. Contrast ratio should be between initial value $\pm 20\%$. Total current consumption should be below double of initial value.
4) High Temperature	70°C 96hrs	
5) Low Temperature	-30°C 96hrs	
6) Thermal shock	25°C→30°C→25°C→70°C 5(min) 30(min) 5(min) 30(min) 5 cycle, 55~60%RH	Total current consumption should be below double of initial value.
7) Vibration	10~55~10hz amplitude: 1.5mm 2hrs for each direction (X,Y,Z)	No defects in cosmetic and operational function are allowable. Total current consumption should be below double of initial value.

8. Handling Precautions

8-1 Mounting method

A panel of LCD module consists of two thin glass plates with polarizers that easily get damaged.

And since the module is so constructed as to be fixed by utilizing fitting holes in the printed circuit board (PCB).

Extreme care should be used when handling the LCD modules.

8-2 Cautions of LCD handling and cleaning

When cleaning the display surface, use soft cloth with solvent (recommended below) and wipe



lightly.

- ☐ Isopropyl alcohol
- ☐ Ethyl alcohol
- ☐ Trichlorotrifluoroethane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- ☐ Water
- ☐ Ketone
- ☐ Aromatics

8-3 Caution against static charge

The LCD module use C-MOS LSI drivers. So we recommend you:

Connect any unused input terminal to V_{dd} or V_{ss} . Do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

8-4 Packaging

- Module employs LCD elements, and must be treated as such.
Avoid intense shock and falls from a height.
To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity.

8-5 Caution for operation

- It is an indispensable condition to drive LCD module within the limits of the specified voltage since the higher voltage over the limits may cause the shorter life of LCD module. An electrochemical reaction due to DC (direct current) causes LCD undesirable deterioration so that the uses of DC (direct current) drive should be avoided.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD module may show dark color in them. However those phenomena do not mean malfunction or out of order of LCD module, which will come back in the specified operating temperature.

8-6 Storage

In the case of storing for a long period of time, the following ways are recommended:

- Storage in polyethylene bag with the opening sealed so as not to enter fresh air outside in it. And with not desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light is. Keeping the storage temperature range.
- Storing with no touch on polarizer surface by any thing else.

8-7 Safety

- It is recommendable to crash damaged or unnecessary LCD into pieces and to wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well at once with soap and water.

9. Precautions for Use

9-1 Both parties should provide a limit sample on an occasion when both parties agree its necessity.

The judgement by a limit sample shall take effect after the limit sample has been



established and confirmed by both parties

9-2 On the following occasions, the handling of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this manual.
- When a new problem is arisen which is not specified in this manual.
- Some problem is arisen due to the change of inspection and operating conditions in users.
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.